TOP FY 2000
Project Narrative

North General Hospital

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New York, NY

This Pilot Program, aimed at using telecommunications technology to alleviate significant chronic pain, will target patients residing in the Upper Manhattan Empowerment Zone (UMEZ) having a diagnosis of advanced cancer, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), end stage renal disease, and AIDS. This geographic area is the primary service area of North General Hospital (NGH), which will be the hub for inpatient and outpatient palliative care services. In 1998, an estimated 550,000 people resided in upper Manhattan, largely an African American and Hispanic population. **Appendix E** features a map with the location of key providers and community organizations in the target service area.

This subject is very timely. Drs. Freeman and Payne (the PIs), are the authors of an *Invited Editorial on the topic of this proposed study* to appear in the New England Journal of Medicine on April 6, 2000.

Project Purpose

Indexing the adequacy of cancer pain management by WHO standards, a recent multi-center study found that minority patients (African-Americans and Hispanics) with pain due to metastatic cancer were three times more likely to have inadequate pain treatment than those seen in non-minority settings.

The death rates from cancer in Central Harlem and East Harlem, part of the study's service area, are significantly higher than in Manhattan and New York City (broadly). In 1998, the death rate per 100,000 population in New York City was 197.4 and 185.1 in Manhattan versus 280.6 in Central Harlem and 202.7 in East Harlem. This speaks to the overall reduced health care quality in Upper Manhattan relative to the rest of the city as a whole.

The fact that Harlem (a major portion of the UMEZ), and by extension other poor populations, suffer more severe physical pain because of the unavailability of morphine and related analgesic compounds, an unfortunately well documented phenomenon, (see Appendix B) is an inequity that must be corrected as soon as humanly possible.

This project equalizes and improves access to pain management as well as broadly improves medical care for the (*pilot*) largely minority population of the UMEZ by deploying a cutting edge audio/visual telecommunications infrastructure with real-time communication capability. The systems will be installed in patients homes, connected to a main systems at North General Hospital (NGH) and the Visiting Nurse Services of New York (VNS). The system will streamline and facilitate the data collection of vital statistics such as heart rate and temperature. Another result will be to reduce stress on the staff and facilities resources of NGH.

A Credible Solution That Employs Network Technologies

In order to significantly improve the pain management of chronically ill patients who have been released from a hospital serving the UMEZ, and who are currently suffering or are expected to suffer significant pain during the course of an illness, and in general to improve patient care, it is the working premise of this pilot study that the following conditions should be in effect:

- Rapid, real-time, direct voice and visual communication between patients, in-home caregivers, and hospital and supporting medical professionals to address ongoing patient problems.
- Telecommunications system that are user friendly (requiring no unusual technical skills) on the patient/home health care side of the link, and equipment that is reliable, robust, and affordable.

- That the health care professionals have up to the minute information (medical history, medication prescribed and in use, the patient's ongoing vital signs and history, nutritional condition, degree, frequency, and severity of pain experienced) available in a database to allow the dispensation of meaningful advice, assurance, and where necessary, medication.
- That a medical professional (physician, nurse, etc.) is available at reasonable times (for "routine" questions, issues, etc. on a "busiest time" schedule –NGH coverage, for severe, problems, seven days per week, twenty four hours per day-VNS coverage) to respond to requests for pain control (and other) medication, respond to reports of changes in patient symptoms with advice (which may include recommending a visit to a physician or the hospital) to the at-home care giver (whether a Visiting Nurse Service professional, an aide, or a relative), and that a care coordinator is available or summoned to assist the patient either by telecommunications or with a visit
- That the health care professionals in the hospital(s) and at the centralized location of the in-home nursing care providers be technically trained to make full use of peripheral computer equipment and databases.
- That there exists a community database of pain controlling medications, with daily updates of pharmaceutical inventories, by drug and by pharmacy location.
- That the information transmitted on the system is secure and that the privacy of the patients participating in this project will be protected

The proposed pilot study meets each of the criteria set forth above.

- The equipment to be used initially is off the shelf, robust, and proven reliable. The in-home units, which are telephone based voice and video communicators, are boxes the size of Cable TV boxes and are manufactured by Caduceus, Health Care, Ltd.
- The in-home hardware requires only the skills to use a telephone and a TV set.
- A partnership between Harlem's North General Hospital (New York State's only minority owned, private, teaching hospital), Memorial Sloan Kettering Cancer Center (one of the foremost cancer treatment and research centers in the world), and the Visiting Nurse Service (the largest in-home care registered nursing providers in both New York City and the Northeast) - VNS will be hooked into the system and will assure proper patient off-hours coverage, guidance, and advice. The Center For Technology Commercialization, CTC, is providing the telecommunications technology, training (hardware and software), and system enhancements.
- Plans call for a one-shift coverage the first year followed by two-shift coverage the second year. VNS will have its system available for emergency coverage on a twenty-four hour basis. Contact appointments will be made by patients for routine communication and advice. *Extraordinary* (as determined by VNS) circumstances will require ready access.
- A database of pharmacies and their pain medication inventories will be assembled, updated daily, and arrangements will made by the participants to assure that patients will always have adequate supplies of pain control medication. The hospital will be the pharmacy of last resort.
- The system uses a point-to-point telephone connection rather than the Internet. In addition, in the event that a third party "taps" into an ongoing session, their presence is immediately detected by the software and the connection is broken.
- Patient confidentiality is maintained through the application of employment agreements that include patient confidentiality as a condition of employment, and staff orientation that highlights this responsibility.

- Patients in the Project will be subject to the same confidentiality protocols as if they were being treated in the Hospital.
- The Harlem Palliative Care Network, a partnership of VNSNY, MSKCC, and NGH will be in effect within and coordinated with this effort.
- CTC will study existing software and hardware systems and will solicit technology and assistance from companies like Microsoft and IBM to assemble second-generation devices which meet the needs of the patient and medical establishment, and which can increase the scope of the services for a future study.

See Appendix D for additional comments from Dr. Richard Payne, one of the study's Principal Investigators.

Realistic, measurable outcomes that are expected to result from implementation of the project
- Measurable improvement in patient pain management care.
- Pilot project system-related improvements in the working relationships between the partners in the study.
- Cost reductions and efficiencies in-patient care.
- Ongoing technical improvements in the system.

Established protocols will be used or new ones developed to quantify the results of the study in a rigorous fashion.

By participating in this project, NGH plans to:
- Build patient capacity for its Palliative and Cancer Center inpatient units (quantifiable),
- strengthen linkages with community physicians (qualitative),
- enhance palliative care capability among its medical and other hospital staff (qualitative),
- reduce Emergency Room use for primary and palliative care services (quantifiable).

Innovation

This will be a groundbreaking partnership dedicated to jointly help solve a major medical-human problem using cutting edge telecommunications technology. The partners each bring to the table their unique skill sets and organizations in such a manner that the whole is greater than the sum of its parts.

Additionally, the study is innovative insofar as homebound patients will be directly involved in their own treatment on an ongoing basis through direct, real-time interaction with physicians and other care givers.

Innovation in the pilot study includes the use of a new telecommunications technology (the Caduceus system) in a unique configuration (voice and visual real-time interactions between patients and groups of medical professionals, each with its own role to play in patient welfare) which, when put into place, will result in a *simple, effective, and cost reducing infrastructure for improving patient care and outcomes which can be implemented nationally*.

This innovative grant proposal provides a system prototype, which can be viewed as a *creative technology-driven national model for health care for the homebound and recently discharged hospital patients*.

Diffusion Potential

The pilot study provides a *configurational basis* for the eventual increase in services and the improvement in the quality of life to the home bound and the seriously ill. The NGH and MSKCC researchers have national and international reputations. Presentations at professional meetings, publications, and the like will disseminate the

results of the pilot program relatively quickly. VNS is the largest nursing care organization in the Northeast and can disseminate the advantages of the new system quickly and credibly. CTC has established relationships with a network including: Federal laboratories (e.g. NASA, NOAA, etc.) universities, private sector companies, and technology transfer organizations around the U.S. These relationships will both allow ready access and established credibility to commercialize improvements to the system initially deployed.

Project Feasibility, Technical Approach, Description

The system to be utilized for remote patient care will be provided by Caduceus Healthcare Ltd., of Nova Scotia, Canada. They have a viable solution to remote patient monitoring, which has been effectively demonstrated.

The Caduceus technology will provide a simple and cost effective solution to the remote telemedicine needs of the Harlem patient population. This technology employs a "box" much like a cable television box. This box connects to a television as well as a phone line. Several peripherals will also be attached to this box, including a real-time digital camera, and blood pressure, temperature, weight and heart rate monitors.

In order to receive treatment, a patient pushes a call button on the box, which will then dial the hospital's nurse station. The nurse station is equipped with a PC-based workstation incorporating several software packages designed to receive remote medical data and record and archive that data under the patient's file. This will give an instant medical history to provide the on-call nurse with a baseline for the patient's health.

Calls are initiated as voice calls over normal phone channels. Upon answering the call, the nurse can at any time switch the call from voice to data, then receiving video as well as data from the remote monitors in the patients home. Nurses can also call the patient in cases where the patient is bed-ridden or immobilized.

CTC has seen this equipment demonstrated on three separate occasions. On each occasion the equipment has worked flawlessly, demonstrating its ease of use and technical capabilities.

Interoperability:

Interoperability on the client side (patient) of the technology is small. However, the server side (nurses/physicians station) can be networked with other stations as well as stations at other hospitals. This would provide a medium in which to share patient information and patient history in the event that the patient were to switch hospitals or need more advanced care. This would also allow for the re-routing of calls if one station were down for maintenance.

Technical Alternatives:

PC-based systems offer more flexibility in the sense that access to the Internet can be provided. However this may present a problem if multiple patients try to call the nursing station at the same time. Using the "box," patients initiate the call via a regular voice call, thus they can be transferred to another nurse if the nurse manning the station is busy. Using a PC via a modem or the Internet will eliminate the capability of having patients call in while another patient is being assisted.

Scalability:

Growth beyond the initial patient population of thirty patients can be readily accommodated by the Caduceus system. It is simply a matter of providing new patients with the proper hardware. In one demonstration 145 consecutive patients were seen using only one hospital monitoring station. This demonstrates that there is significant capacity for the program to grow past its initial test population.

Applicant Qualifications

North General Hospital (NGH) is the most modern hospital in Harlem [See Appendix D for profiles of complimentary programs]. NGH is also the only private, minority-owned/run teaching hospital in New York State. NGH is a 200-bed community (teaching) hospital located in Harlem whose mission is to improve the health status of community residents and revitalize Harlem through economic and housing initiatives. NGH treats over 15,000 individuals annually, of which approximately 55% are African Americans and 36% Hispanics. NGH employs over 1,000 people and is Harlem's largest private employer.

NGH sponsors residency-training programs in internal medicine, general surgery, and psychiatry. It also operates the Paul Robeson Center, an ambulatory care satellite providing adult, pediatric, prenatal and dental services, and the Helene Fuld College of Nursing, which confers 120 registered nursing degrees a year. For additional information about the myriad activities of NGH, see Appendix D.

Sustainability

The applicants believe that upon the successful completion of the pilot program, private sector insurers and other providers will take on the program as a commercial venture. In fact, it is believed that the program will be significantly expanded as both the improved patient care and the cost savings become evident.

Community Involvement

Besides North General Hospital, the central focus of the study, the following organizations will participate as partners in this program. Please see Appendix D for further descriptions of the partners.

- Memorial Sloan Kettering Cancer Center (one of the world's foremost cancer treatment and research institutions),
- Visiting Nurse Service of New York (the largest provider of in-home registered nurses in the Northeast),
- The Upper Manhattan Empowerment Zone Development Corporation (one of the most successful and innovative development organizations for minority and disadvantaged regions –see Appendix D for a description), UMEZ is the source of matching funds, and
- The Center For Technology Commercialization, (a unique group of successful businessmen-scientists-entrepreneurs committed to bringing cutting edge technologies to the marketplace).

Visiting Nurse Service of New York

VNSNY is the preferred home care provider for both MSKCC and NGH. In 1998, VNSNY served over 5,500 patients residing in East and Central Harlem, many with chronic and life-threatening illnesses. Specifically, VNSNY served close to 1,000 patients within this community that had one of the targeted conditions as their primary diagnosis. VNSNY operates one of the largest hospice programs in New York City, serving over 1,500 terminally ill patients each year. In 1998, VNS Hospice provided service to 104 persons in Central and East Harlem. In

addition, VNSNY is the largest community provider for persons with HIV/AIDS.

By participating in this project, VNSNY plans to achieve the following:

- retain patients within the community by building stronger linkages with supportive services and institutional providers
- streamline data collection and organization
- strengthen care coordination among physicians, hospitals, and community providers
- enhance the palliative care capability of its non-hospice clinical staff
- develop a model to expand palliative care services for its entire program. (See Appendix D)

Memorial Sloan-Kettering Cancer Center

MSKCC is an internationally renowned Comprehensive Cancer Center that provides patient care, research, and training in all aspects of oncology, including pain management and end-of-life-care. In 1998, MSKCC had a total of 18,000 inpatient admissions and 275,000 outpatient visits.

Since 1981, MSKCC has operated a comprehensive, multidisciplinary Pain and Palliative Care Service. Today the Service is staffed with six attending physicians and eight advanced practice nurses. A consultative service on pain management is available to MSKCC inpatients 24 hours a day and ambulatory services are available daily. Educational outreach programs are a key component of the Service. Currently MSKCC is actively collaborating with NGH in establishing its own palliative care program in Harlem. MSKCC is assisting NGH in training physician and nursing staff, revising hospital policy and procedures, and implementing an inpatient pain management consultative service.

By participating in this project, MSKCC plans to:

- improve access to pain management and palliative care for medically under-served populations
- expand cancer care expertise into under-served communities
- enhance the clinical knowledge of medical personnel working in Harlem.

Upper Manhattan Empowerment Zone Development Corporation (UMEZ)

The Upper Manhattan Empowerment Zone Development Corporation ("UMEZ") is a private, not-for-profit organization whose mission is to stimulate business development activity and create jobs for residents of the Upper Manhattan portion of the EZ, which includes the Central, East and West Harlem, Washington Heights and Inwood communities. UMEZ leverages $250 million of federal, state, and city funding to facilitate private investments that expand economic activity, enhance the ability of local residents, businesses, and institutions to benefit from economic opportunities in the zone, and improve the quality of life for residents and employees. A more complete description of UMEZ can be found in Appendix D.

Center for Technology Commercialization

The Center For Technology commercialization, CTC, is a non-profit corporation involved in the business of commercializing technologies developed by Federal laboratories (NASA, NOAA, etc.) as well as universities and private sector companies. It has been initiated and completed scores of licenses and has spearheaded the creation of many new companies.

Where necessary, CTC will assist in creating and managing companies around technologies. Several of the senior personnel are knowledgeable in the areas of biotechnology, medical devices, and diagnostic technologies. One of them is presently involved in the development of new, rapid microbiological diagnostic systems.

CTC is involved on a daily basis networking in the area of cutting edge technologies, and brought the Caduceus technology to the partnership. CTC will be involved in installing the

systems, training the users, and training local companies in servicing the hardware. For additional information about CTC, see Appendix D.

Other Community Members Involvement

This program will include a wide range of community representatives that touch the life of individuals with life-threatening illnesses. Pharmacists play a key role in advising families on health care issues and in supplying pain medication. The police can be critical to improving access to controlled substances in these neighborhoods by providing security to retail pharmacies stocking opiates and by accepting the importance of the use of pain medication among persons with life-threatening illnesses. Churches and religious leaders would be included in the network to build trust in seeking palliative care and to provide spiritual support. The church is very important among Hispanic and African American families and is often the first resource they turn to during a period of crisis. Pastoral care is a possible near-term extension of the system. All these individuals and groups will be asked for their cooperation.

Support For End Users

Involving family and caregivers through training and care coordination, the project team will seek to improve communication among professionals, patients, families, and caregivers. A critical element in this communication will be the nurse and paraprofessional in the home. They will be a key link between the family, the community, and project staff. One intervention that may be employed is "just-in time" E-mail reminders to the field nurses through their hand-held pen computers.

Technical support for all end users will be provided initially through Caduceus Healthcare Ltd. All nurses and physicians that will be working on the project will receive proper training on how to use the hospital monitors as well as how to set up the patient monitoring device. This will be facilitated through a training course at the onset of the project. CTC will also provide personnel to be trained in technical support.

Privacy

Privacy becomes an issue in this project when dealing with patients' medical records. Medical information in this project will only be stored at the hospital monitoring station. The patient's hardware in their own home does not have the capability to store any medical data. This would not allow a compromise of confidential data through the tampering of hardware in the patient's home, which may be accessible to those that may do so. The hospital's monitoring station will have proper safeguards installed. All patients will be subject to confidentiality protocols as if they were treated in the Hospital.

Reducing Disparities

The demographics of the NGH service area are compelling, and the hospital's patient population is clearly disadvantaged, economically and socially.

According to the United Hospital Fund Community Atlas (1994), the area is primarily Black and Hispanic. Based on the 1990 census, seventy-two percent of the population in Central Harlem was Black and twenty-five percent was Hispanic. In East Harlem, fifty-two percent of the population was Black and forty-seven percent were Hispanic. While not officially measured, there has been a notable increase in the number of immigrants living in Harlem, particularly immigrants from West Africa, Central America and South America. The median household income was (1990) $14,600-$16,000, with a large part of the population Medicaid eligible.

Establishing this pilot program, and expanding it into a full blown community program upon its success, will make substantial inroads into reducing the disparity between the UMEZ and New York City as a whole in pain palliation, and in healthcare broadly.

Strategies For Overcoming Barriers To Access

The entire proposed program is designed around an infrastructure focused on overcoming barriers to access. This includes the in-home telecommunications system, the health care provider telecommunication and monitoring protocols, the pain control medication inventory database, the community involvement, and the hospital as the pharmacy of last resort. Overcoming barriers to access might, in fact, be the title of the project.

Evaluation and Documentation

As part of the program, existing protocols will be accepted or new protocols will be established for measuring the pain management and patient care improvements related to the pilot program versus an equivalent population of patients not participating in the program. Data will be evaluated on an ongoing basis in order to improve the performance of the pilot study, wherever possible. Questionnaires will be distributed to medical participants (and possibly structured interviews conducted with professional participants) on a quarterly basis and will be evaluated for system efficacy in improving the interactions between the professional parties in the study.

A Technology Assessment and Improvement Committee will be formed whose role it will be to measure the technical performance of the project, suggest remedies where appropriate, and chart the ongoing future development program. Reports will be generated on a systematic basis for review by the participating entities. The team will provide physician and other hospital staff with on-going feedback on their performance against established goals. Targets will be set for achieving all of the goals of the project, i.e. care coordination, improving quality of life, and overcoming barriers to care.

Budget Implementation

Entity	Federal Funds	Matching Funds	Total
CTC	$120,982.00	$0.00	$120,982.00
North General Hospital	$218,757.00	$353,638.00	$572,395.00
Sloan Kettering	$0.00	$58,066.00	$58,066.00
Visiting Nurses Services	$26,481.00	$197,643.00	$224,124.00
Travel	$6,465.00	$1,055.00	$7,520.00
Meetings	$1,197.00	$123.00	$1,320.00
Equipment	$149,459.00	$0.00	$149,459.00
Non-Cash			
North General Hospital		$65,000.00	$65,000.00
Totals	**$523,341.00**	**$675,525.00**	**$1,198,866**

Caduceus Healthcare, Ltd will provide equipment for the project with the exception of five doctor workstations. See *Appendix* A for project timeline.